

CLAIMS

What is claimed is:

1. A method for predicting the soybean cyst nematode resistance of soybean genotypes comprising:
 - 5 (a) obtaining a spectroscopic scan of a soybean sample to provide an assay spectra over a predetermined frequency range;
 - (b) comparing the assay spectra with a predictive model based upon corresponding spectra obtained over the predetermined frequency range from at least one base sample selected from the group consisting of known soybean cyst nematode resistant genotypes, known soybean
10 cyst nematode susceptible genotypes, and combinations thereof to provide comparison results; and
 - (c) predicting the soybean cyst nematode resistance of the soybean sample based upon the comparison results.
- 15 2. The method of Claim 1 wherein said soybean sample is selected from the group consisting of leaf, stem, and seed.
3. The method of Claim 2 wherein said soybean sample is seed.
4. The method of Claim 1 wherein the comparison results in step (b) are based upon a visual comparison between the assay spectra and the predictive model.
- 20 5. The method of Claim 1 wherein the comparing step (b) comprises using a discriminant analysis based upon the predictive model.
6. The method of Claim 6 wherein the discriminant analysis is a regression analysis.
7. The method of Claim 6 wherein the discriminant analysis comprises
25 comparing peak intensity within the predetermined frequency range between the assay spectra and the corresponding spectra.
8. The method of Claim 1 wherein the model used in the comparing step (b) comprises a natural intelligent algorithm.

9. The method of Claim 8 wherein the natural intelligent algorithm is selected from the group consisting of an adaptive filter, a neural network, and combinations thereof.

5 10. The method of Claim 1 wherein the predetermined frequency range comprises the near-infrared.

11. The method of Claim 1 wherein the predetermined frequency range is the near-infrared.

12. A method for predicting the soybean cyst nematode resistance of soybean genotypes comprising:

- 10 (a) measuring near-infrared data of a soybean tissue sample using a near infrared (NIR) spectrometer to scan over the near infrared range of radiation,
- (b) transforming the near-infrared data measured in (a) by mathematical transformation to obtain mathematically transformed data,
- 15 (c) inputting the transformed data into a predictive model for the soybean cyst nematode resistance of said sample, and
- (d) obtaining a prediction of the soybean cyst nematode resistance of said sample.

13 ~~14~~. The method of Claim 13 wherein said sample is selected from the group consisting of soybean leaf, stem, and seed.

14 ~~15~~. An electronically programmable apparatus for predicting the soybean cyst nematode resistance of soybean genotypes comprising:

- (a) a spectrophotometer configured to measure spectrographic data from a soybean tissue sample;
- 25 (b) a predictive model for the soybean cyst nematode resistance of the sample;
- (c) program instructions for processing the spectrographic data by mathematical transformation to obtain mathematically transformed data acceptable for use in the predictive model; and

- (d) means for using the mathematically transformed data to obtain a prediction of the soybean cyst nematode resistance of the sample.

15 16. The electronically programmable apparatus of Claim 15 wherein the spectrographic data is near-infrared data.

5 16 17. The electronically programmable apparatus of Claim 16 wherein said near-infrared data is absorption data.

17 18. The electronically programmable apparatus of Claim 15 wherein the near-infrared data is reflectance data.

10 18 19. The electronically programmable apparatus of Claim 15 wherein the predictive model is a discriminant analysis.

19 20. The electronically programmable apparatus of Claim 15 wherein the predictive model is a natural intelligent algorithm.

20 21. A machine readable form for use in predicting the soybean cyst nematode resistance of soybean genotypes comprising machine readable instructions operable for:

- (a) measuring near-infrared data of a sample selected from soybean seed, soybean plant tissue, or mixtures thereof using a near infrared (NIR) spectrometer to scan over the near infrared range of radiation;
- (b) transforming the near-infrared data measured in (a) by mathematical transformation to obtain mathematically transformed data;
- (c) inputting the transformed data into a predictive model for the soybean cyst nematode resistance of said sample; and
- (d) obtaining a prediction of the soybean cyst nematode resistance of said sample.

25 21 22. Soybean seed generated from a breeding program using the method of Claim 1.

22 23. Soybean seed generated from a breeding program using the method of Claim 12.

- 23 ~~24.~~ A method for comparing genotypes of biological samples comprising:
- (a) obtaining a spectroscopic scan of a tissue sample to provide an assay spectra over a predetermined frequency range; and
- (b) comparing the assay spectra with a predictive model based upon
- 5 corresponding spectra obtained over the predetermined frequency range from at least one control sample to provide comparison results.
- 24 ~~25.~~ The method of Claim 24 wherein said sample is selected from the group consisting of plant, animal, bacterial, fungal, and viral samples.
- 25 ~~26.~~ The method of Claim 25 wherein said sample is plant.
- 10 26 ~~27.~~ The method of Claim 25 wherein said sample is animal.
- 27 ~~28.~~ The method of Claim 25 wherein said sample is bacterial.
- 28 ~~29.~~ The method of Claim 25 wherein said sample is fungal.
- 29 ~~30.~~ The method of Claim 25 wherein said sample is viral.
- 30 ~~31.~~ The method of Claim 26 wherein said plant is soybean.
- 15 31 ~~32.~~ The method of Claim 24 wherein said spectroscopic scan is an infrared spectroscopic scan.
- 32 ~~33.~~ The method of Claim 24 wherein said genotype is soybean cyst nematode resistance.
- 33 ~~34.~~ A plant breeding program based on results obtained from the method of Claim 24.
- 20 34 ~~35.~~ Seeds generated from the method of Claim 30.